

CLAIMS

1. A compound semiconductor light-emitting diode comprising
a light-emitting layer composed of a Group III-V compound
5 semiconductor, and a current diffusion layer provided on the
light-emitting layer and composed of a Group III-V compound
semiconductor, characterized in that the current diffusion
layer is composed of a conductive boron-phosphide-based
semiconductor and has a bandgap at room temperature wider
10 than that of the light-emitting layer.
2. A compound semiconductor light-emitting diode according
to claim 1, wherein the current diffusion layer is composed
of at least one species selected from among
15 boron monophosphide,
boron gallium indium phosphide represented by a compositional
formula $B_{\alpha}Ga_{\gamma}In_{1-\alpha-\gamma}P$ ($0 < \alpha \leq 1$, $0 \leq \gamma < 1$),
boron nitride phosphide represented by a compositional
formula $BP_{1-\delta}N_{\delta}$ ($0 \leq \delta < 1$), and
20 boron arsenide phosphide represented by a compositional
formula $B_{\alpha}P_{1-\delta}As_{\delta}$.
3. A compound semiconductor light-emitting diode according
to claim 1, wherein the difference between the bandgap at
25 room temperature of the current diffusion layer and the
bandgap at room temperature of the light-emitting layer
accounts for 0.1 eV or more.

4. A compound semiconductor light-emitting diode according to claim 1, wherein the current diffusion layer has a bandgap at room temperature of 2.8 eV to 5.0 eV.

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5. A compound semiconductor light-emitting diode according to claim 1, wherein the current diffusion layer has a carrier concentration at room temperature of $1 \times 10^{19} \text{ cm}^{-3}$ or more, a resistivity at room temperature of $5 \times 10^{-2} \Omega \cdot \text{cm}$ or less, and
10 a thickness of 50 nm to 5,000 nm.

6. A compound semiconductor light-emitting diode according to claim 1, wherein the diode includes, between the current diffusion layer and the light-emitting layer, a cladding
15 layer composed of a Group III-V compound semiconductor, and the cladding layer has a bandgap at room temperature wider than that of the light-emitting layer and equal to or narrower than that of the current diffusion layer.

20 7. A compound semiconductor light-emitting diode according to claim 6, wherein the cladding layer is composed of a Group III-V compound semiconductor containing aluminum, gallium, and indium, and the current diffusion layer is composed of a boron-phosphide-based semiconductor containing at least one
25 species selected from among aluminum, gallium, and indium.

8. A compound semiconductor light-emitting diode according

to claim 6 or claim 7, wherein the diode includes a composition-graded layer having a compositional gradient and being composed of a boron-phosphide-based semiconductor, and the composition-graded layer serves as the current diffusion layer and the cladding layer.

9. A compound semiconductor light-emitting diode according to claim 1, wherein the light-emitting layer is composed of an aluminum gallium indium phosphide mixed crystal represented by a compositional formula $\text{Al}_x\text{Ga}_y\text{In}_z\text{P}$ ($0 \leq X, Y, Z \leq 1, X + Y + Z = 1$), and at least one of the current diffusion layer and the cladding layer are composed of an undoped boron-phosphide-based semiconductor to which no impurity element has been intentionally added.

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10. A compound semiconductor light-emitting diode according to claim 1, wherein an Ohmic contact electrode is joined to the current diffusion layer or the composition-graded layer.